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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/519,443	12/29/2004	Dewen Dong	7518-3	2407
<div>7590 12/21/2007</div> <div>Thomas Q Henry Woodard Emhardt Moriarty McNett & Henry 3700 Bank One Center Tower Indianapolis, MN 46204</div>				
			EXAMINER TRINH, THANH TRUC	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 12/21/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/519,443	Applicant(s) DONG ET AL.	
	Examiner Thanh-Truc Trinh	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>5/30/06, 8/10/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group I, claims 1-19 in the reply filed on 1/19/2007 is acknowledged.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Limitation "the nanocrystals have an ionization potential that is higher than that of the surrounding inorganic material" in lines 2-3 renders claim 13 indefinite as to what "the nanocrystals" and "the surrounding inorganic material" are referring to.

Claim 13 recites the limitations "the nanocrystals" and "the surrounding inorganic material" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-2, 5-9 and 18-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Lupo et al. (US Patent 6281430).

Regarding claims 1-2 and 18-19, Lupo et al. teaches a solar cell comprising p-type discotic liquid crystal material forming column (5) with interspaces (9) filled with an amorphous n-type material and extending between a first electrode 3 and a second electrode 1. (See Figure 1, col. 2 lines 16-20, col. 3 line 62 to col. 4 lines 10). Lupo et al. also teaches a typical length of interspaces is preferably less than 10 nm (See col. 2 lines 6-7). It is the Examiner's position that the interspaces are thin enough to correspond to a plurality of nanowires. Said column (5) corresponds to the instant structure disposed between nanowires as seen in Figure 1.

Regarding claims 5-9, Lupo et al. teaches the structure (or column 5) comprises a crosslinked organic polymer material in a columnar liquid crystalline phase. (See Figure 1; col. 2 line 63 through col. 3 line 3; col. 4 line 64 through col. 5 line 55; Example 1)

2. Claims 1-5, 7 and 10-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Kalkan et al. (U.S. Patent Application Publication 2002/0192441).

Regarding claims 1-5, 7 and 10-17, Kalkan et al. teaches a photovoltaic device prepared with nanoprotusions (13) such as CdTe extend between a first electrode of conductive layer 11 and a second electrode 14, wherein the voids between the nanoprotusions are filled with a conjugated polymer semiconductor material (12) such as poly(p-phenylenevinylene) (see paragraphs 0023 to 0040, and Figure 1). Said nanoprotusions (13) of CdTe correspond to the instant nanowires and said semiconductor material (12) such as poly(p-phenylenevinylene) corresponds to the instant structure disposed between the nanowires. As seen in Figure 1, said semiconductor material (12) forms columns around the nanowires (or protrusions 13), therefore it is the Examiner's position that the structure (or semiconductor material 13) comprises columnar structure or tubes locating around a respective nanowire (or respective protrusion 13). Said poly(p-phenylenevinylene) corresponds to organic polymer polyaromatic compound of instant claims 5 and 7. Said CdTe material for nanoprotusion (13) corresponds to II-VI inorganic nanocrystals with transition metal ion of cadmium and anionic species of tellurium in instant claims 10-17. Since Kalkan et al. teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

Regarding claim 18-19, Kalkan et al. also teaches the nanoprotusions have a diameter of 1 to 50 nm (see claim 18), which is well cover the instant limitations of nanowires having less than 20 nm or less than 10 nm in diameter.

3. Claims 1-5 and 7-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Sager et al. (U.S. Patent Application Publication 20040250848). The subject matter

relied upon below is supported by Sager et al's provisional application 60390904 filed in June 22, 2002, therefore its effective filing date is June 22, 2002. The reference thus qualifies as prior art under 35 U.S.C. 102(e).

Regarding claims 1 and 10-17, as seen in Figure 1, Sager et al. discloses a photoelectric cell comprising a first and second electrodes (102 and 108); a plurality of nanowires (104) of CdSe which extend between the electrodes (See Figures 3A-C, paragraphs 0053-0064); and a structure (106) in the form of mold, template or mesostructure disposed between the nanowires (See paragraphs 0019-0026, 0042-0052). Since Sager et al. discloses the nanowires comprises inorganic semiconductor from group II-VI for transporting electrons such as CdSe which is particularly the same material as one of the instant materials, it is the Examiner's position that the CdSe nanocrystals have an ionization potential higher than that of the surrounding inorganic material.

Regarding claim 2, as seen in Figures 1, 3A-C, Sager et al. discloses the structure (106 in Figure 1, 302 in Figures 3A-C) is columnar.

Regarding claim 3, as seen in Figures 1, 3A-C, Sager et al. discloses the structure (106) comprises tubes each of which is located around a respective nanowires (or nanostructures 104). It is the Examiner's position that the structure (106) of Sager et al. comprises tubes since the structure (106) comprises tubular hollow spaces for the nanowires (104).

Regarding claim 4, as seen in Figure 1, Sager et al. disclose tubes (or structure 106) extend between the electrodes.

Regarding claim 5, Sager et al. describes the structure comprises organic polymer material such as P3HT and polymeric mold, template or mesoporous structure (See paragraphs 0042-0063).

Regarding claim 7, Sager et al. describes the organic polymer material comprises a P3HT, poly (3-hexylthiophene) (See paragraph 0063). It is the Examiner's position that thiophene is an aromatic compound and poly(3-hexylthiophene) is a polyaromatic compound.

Regarding claims 8-9, Sager et al. describes the organic polymer material comprises a liquid crystalline phases (See paragraphs 0028, 0042-0049), or a columnar liquid crystalline phase as structure (mold, template or mesoporous structure 106) in Figure 1.

Regarding claims 18-19, Sager et al. teaches the mesoporous structure having the porous template having pore diameter of 5 nm (See paragraph 0046). The pores will eventually be filled with nanowires (or nanostructure 104) (See paragraphs 0008, 0060-0064). Therefore it is the Examiner's position that the diameter of the nanowires is 5 nm, which is well within the range of less than 20 nm, or less than 10 nm.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
4. Claims 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sager et al. in view of Bellmann et al. (PGPub 20010017155)

Sager et al. discloses a photoelectric cell as described in claim 1, wherein the mesostructure (or the instant structure) comprises hole conducting polymer P3HT. (See 4th paragraph of page 13).

Sager et al. does not specifically teach the structure comprises cross-linked organic polymer material.

Bellmann et al. teaches a crosslinked polymer that is used for hole conducting polymer in solar cell. (See paragraphs 0021-0022 and 0025).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photoelectric cell of Sager et al. by embedding crosslinked hole conducting polymer as taught by Bellman et al. into the mesostructure, because Bellmann et al. teaches that the crosslinked hole conducting polymer would improve overall device stability, especially thermal stability. (See paragraph 0023). In

such combination, it would have been obvious that the structure (mesostructure, mold or template) comprises a crosslinked organic polymer material.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
12/06/2007


NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700